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AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: "DELIVERY AND/OR COLLECTION OPTIMIZATION SYSTEM & METHOD"

The invention is described in the following statement:

TITLE

DELIVERY AND/OR COLLECTION OPTIMIZATION SYSTEM & METHOD

FIELD OF THE INVENTION

The invention relates to a delivery and/or collection optimization system and method. In particular, although not exclusively, the invention relates to a system and method for calculating a quickest and/or shortest route to deliver items to and/or collect items from a plurality of locations.

BACKGROUND TO THE INVENTION

When delivering items to and/or collecting items from multiple locations, it is usually desirable to minimise the distance travelled between the locations and more particularly to minimise the time taken to perform the deliveries and/or collections. For example, a delivery person for a pizza company will usually deliver a number of pizzas from a production location to a plurality of different customers situated at different locations. The delivery person usually reviews the destinations for the pizzas, consults a map of the delivery area to locate the destinations and mentally determines their own route to deliver the pizzas.

In another example, courier firms usually have a central distribution depot responsible for a particular area or territory from which couriers pick-up packages, which are delivered to multiple locations by a courier. The courier usually also collects packages from multiple locations, either in the same run or in a separate run. The collected packages are then delivered back to the central distribution depot, e.g., for transportation interstate or overseas. Although the

courier firms can track their vehicles and the packages being collected and delivered, the driver is not provided with any assistance in determining the order of their deliveries and/or collections. The courier usually consults a street directory or the like to identify destinations and collection locations and mentally works out a route in order to most efficiently make their deliveries and/or collections.

In the above examples, and in many other delivery and collection scenarios, it is desirable to minimize delivery and collection times to maximize the number of possible deliveries/collections; to minimize overheads such as fuel consumption and wear and tear on vehicles; and, in numerous cases such as the pizza example above, to preserve the product being delivered/collected. Conventionally employed methods of manually consulting a street directory, map or the like to devise an optimum route are time consuming and prone to human error. Furthermore, there have been numerous fatal collisions caused by drivers consulting street maps and the like whilst driving.

In-vehicle navigation equipment is commercially available, which assists a driver in travelling from a first location to a second location, but such equipment does not provide an optimised route for the delivery/collection of items to/from multiple destinations/locations. Another drawback of such systems is their cost since they often rely on GPS navigation.

Hence, there is a need for a system and/or method that provides an optimised delivery and/or collection route for delivery to/collection from multiple locations.

DISCLOSURE OF THE INVENTION

In one form, although it need not be the only or indeed the broadest form, the invention resides in a method of optimizing delivery to and/or collection from a plurality of delivery/collection locations, said method including the steps of:

identifying a plurality of delivery/collection locations; and

calculating an optimized route for delivery to and/or collection from said plurality of locations using stored geographic data.

Identifying the plurality of delivery/collection locations may include specifying a street number, a street name, map coordinates, longitude and/or latitude figures and/or a name associated with said delivery/collection locations.

The stored geographic data preferably comprises one or more of the following: street coordinates, speed limits and/restrictions, locations of one-way streets, traffic lights, roundabouts, no right turns, road closures, traffic restrictions, traffic density variations and the like.

The step of calculating an optimized route may further include:

a) determining every possible order for traveling between all target locations;

b) determining the shortest route in terms of distance and/or the quickest route in terms of time between each target location for each of the possibilities found in step a); and

c) determining the shortest overall route in terms of distance and/or the quickest overall route in terms of time for traveling between all target locations based on the shortest and/or quickest routes respectively found in step b).

The method may further include the step of identifying a starting location where the starting location is not permanently fixed.

In another form, the invention resides in a system for optimizing delivery to/collection from a plurality of locations, said system comprising:

input means for entering details of said plurality of locations;

storage means for storing geographic data;

processing means for calculating an optimized route using said geographic data for delivery to/collection from said plurality of locations; and

output means for communicating said optimized route to a user.

Suitably, the input means is a keyboard or touch sensitive screen.

Suitably, the output means is a screen and/or a printer.

Further features of the invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention and to enable a person skilled in the art to put the invention into practical effect preferred embodiments of the invention will be described by way of example only with reference to the accompanying drawings, wherein:

FIG 1 shows a schematic representation of the system of the present invention;

FIG 2 shows a flowchart of steps involved in the method of the present invention;

FIG 3 is a perspective view of an embodiment of the system of the present invention; and

FIG 4 shows the embodiment of FIG 3 with an access panel in an open position.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIG 1, system 2 of the present invention comprises an input means 4, such as a keyboard or touch sensitive screen, coupled to processing means 6. Processing means 6 may be any suitable, commercially available processor familiar to persons skilled in the relevant art, such as a Pentium III by Intel Corporation, capable of executing the operations described hereinafter in a time frame of the order of seconds or less. Processing means 6 is coupled to storage means in the form of database 8, to memory 10 and to output means 12, such as a screen or printer.

Database 8 stores geographic data, the content of which may be limited to an area, territory, city or other region for which the system and method of the present invention will be employed. The geographic data may be stored in any suitable format and may be stored, for example, in the format shown in Table 1 below. The street name and street number of a location, a suburb name and the latitude and longitude of the location may be specified for a single location. Any combination of such identifiers for a location may be stored, the particular combination being sufficient to accurately identify the location. The identifiers are not limited to those specified in Table 1 or the format in which they are specified. For example, additional and/or alternative identifiers may be employed, such as place/building/location names, e.g. Woolloongabba Stadium.

Table 1

Street number	Street name	Suburb name	Latitude	Longitude
25	Smith St	Collingwood	112.4503	-29.4932

The geographic data is interrogated to determine an optimized route for

deliveries to and/or collections from multiple locations. The geographic data also comprises further information that could be relevant in determining an optimized route, such as the location of one-way streets, traffic lights, roundabouts, no right turns, road closures and restrictions and the like, speed limits and/or traffic density variations over time, such as peak hour traffic flows, the durations thereof and occurrence times and the like. Such geographic data is commercially available from, for example, Geographic Information Systems.

The particular data source selected should provide accurate geographic data that is kept up to date with changing road layouts and the like. One commercially available data source is updated every 3 months, which is sufficient to keep track of such changes. Updates may be downloaded to the database 8 by any suitable means known to persons skilled in the relevant art, such as via a global communications network such as the Internet and a USB port.

Nonetheless, the system and method of the present invention includes provisions for updating or supplementing the geographic data with transient route modifications. Feedback, such as updating or supplementing the geographic data with, for example, temporary road closures, such as traffic accidents, may be utilized. Such updated information may be provided in substantially real time through an internet feed. Alternatively, or additionally, the user may specify the road, or section thereof, that has been temporarily closed. Calculation of the optimized route will then factor in the updates.

The method of the present invention will now described with reference to the flowchart if FIG 2. With reference to step 20, in the case where a starting point for making the deliveries and/or collections is fixed, such as in the pizza

delivery example described above, the starting location may be hard coded into the system 2. Alternatively, if the starting point can vary, such as with courier deliveries and collections, the starting location can be entered via input means 4. In step 22, details of the multiple delivery and/or collection locations are entered via input means 4. The details entered may be in the form of addresses of the delivery and/or collection locations, map coordinates or grid references and/or latitude and longitude figures as shown in Table 1 above. Alternatively, a reference name may be used such as a customer name with which a delivery and/or collection location is associated and stored in the system 2. In step 24, based on the starting point, the multiple delivery and/or collection locations, and the geographic data stored in database 8, the quickest and/or shortest route for reaching the multiple locations is calculated according to the algorithm specified below:

Step 1. Determine every possible order for traveling between all target locations;

Step 2. Determine the shortest route in terms of distance and/or the quickest route in terms of time between each target location for each of the possibilities found in step 1;

Step 3. Determine the shortest overall route in terms of distance and/or the quickest overall route in terms of time for traveling between all target locations based on the shortest and/or quickest routes respectively found in step 2.

The shortest and/or quickest routes are calculated based on the distances

between target locations and the other geographic data specified herein, such as speed limits, traffic lights and traffic densities at particular times of the day. The system will comprise a clock so that the time of day can be factored into the route optimization calculation. For example, certain speed restrictions or high traffic densities will only apply during specified periods. The calculated quickest overall route between the target locations is then output, as shown in step 26, by output means 12.

The system 2 may be situated at the starting point for the deliveries/collections, such as in the pizza parlour, store, courier depot or the like. The optimized route may be displayed on the screen at the starting point. A hard copy is preferably also produced for the driver to bring with them to which they can refer rather than having to memorize their route. Alternatively, the system 2 is provided for each driver in a portable unit, as shown in FIGS 3 and 4.

With reference to FIGS 3 and 4, the portable unit 30 comprises a strong, lightweight housing 32 formed from, for example, acrylic and a high resolution, touch-sensitive colour LCD screen 34 familiar to those skilled in the relevant art. Screen 34 can therefore serve as both an input means and an output means. A small, high speed thermal printer 36 may be incorporated into, or coupled to, the unit 30 to generate, for example, a receipt or hard copy of a map of the optimized route. As shown in FIG 4, unit 30 may comprise a flip-down access panel 38 that enables quick and easy replacement of paper roll 40. The unit may also be provided with a light (not shown) for illumination whilst entering and retrieving information at night or in poorly lit situations.

Provision of system 2 in a portable unit 30 for each driver is preferred, for example, in a courier scenario. A driver may commence a delivery/collection run

and receive new instructions to make, for example, a further collection. The courier's present location along with the new collection location can be entered into system 2 and an updated optimized route calculated without requiring the courier to return to a depot or the like to perform the calculation.

Hence, the system and method of the present invention enable an optimized route for delivery to and/or collection from multiple locations to be easily, rapidly and accurately calculated. The use of updateable, stored geographic data obviates the need for expensive GPS systems, rendering the provision of multiple systems 2 to, for example, a fleet of couriers or pizza deliverers, a more viable option.

It will be appreciated that the present invention is not limited to the examples described above and the present invention could be applied to any scenario in which it is desirable to optimize delivery to and/or collection from multiple locations. For example, the present invention could be applied to pathology delivery and collection wherein samples have to be collected from and delivered back to medical practices in various locations and delivered to a pathology laboratory. Samples usually have different time frames attached to their processing and such time frames may be factored into the optimized delivery method and system of the present invention.

Another application of the present invention could be the delivery of concrete by mobile mixers to a plurality of locations. Conventionally, an order for concrete needs to be over a minimum volume because it is not possible to deliver small volumes of concrete to multiple locations before the concrete dehydrates and is therefore unusable because of the deterioration of its strength characteristics and the like. By virtue of the present invention, optimization of

the delivery route, and therefore delivery times, to multiple locations permits smaller volumes of concrete to be delivered before the concrete becomes unusable.

Further applications of the present invention include the delivery to and/or collection of goods from multiple customers at different locations such as the delivery of purchased items by department stores or supermarkets to a plurality of customers.

Throughout the specification the aim has been to describe the invention without limiting the invention to any one embodiment or specific collection of features. Persons skilled in the relevant art may realize variations from the specific embodiments that will nonetheless fall within the scope of the invention.

Dated this Thirtieth day of April 2003

NEXTSPACE TECHNOLOGIES PTY LTD

By their Patent Attorneys

FISHER ADAMS KELLY

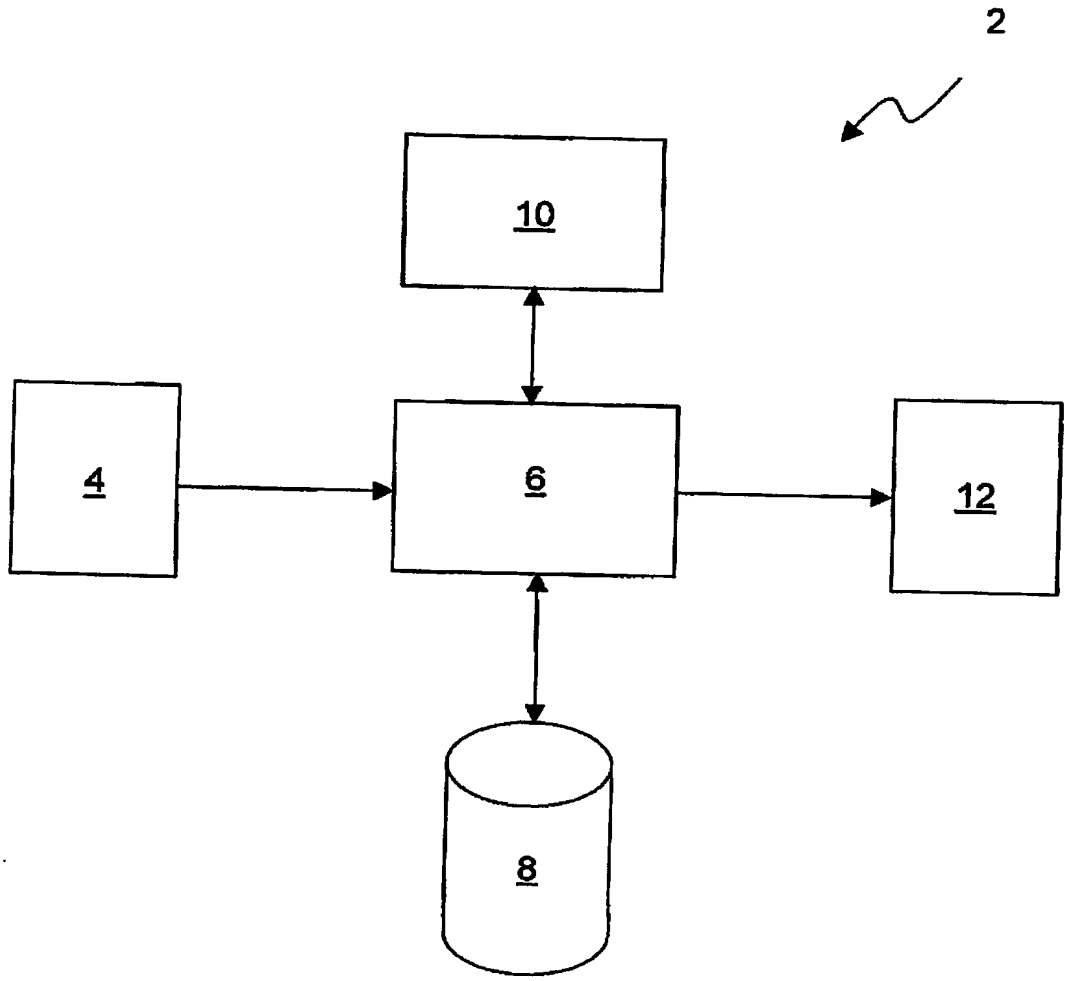

FIG 1

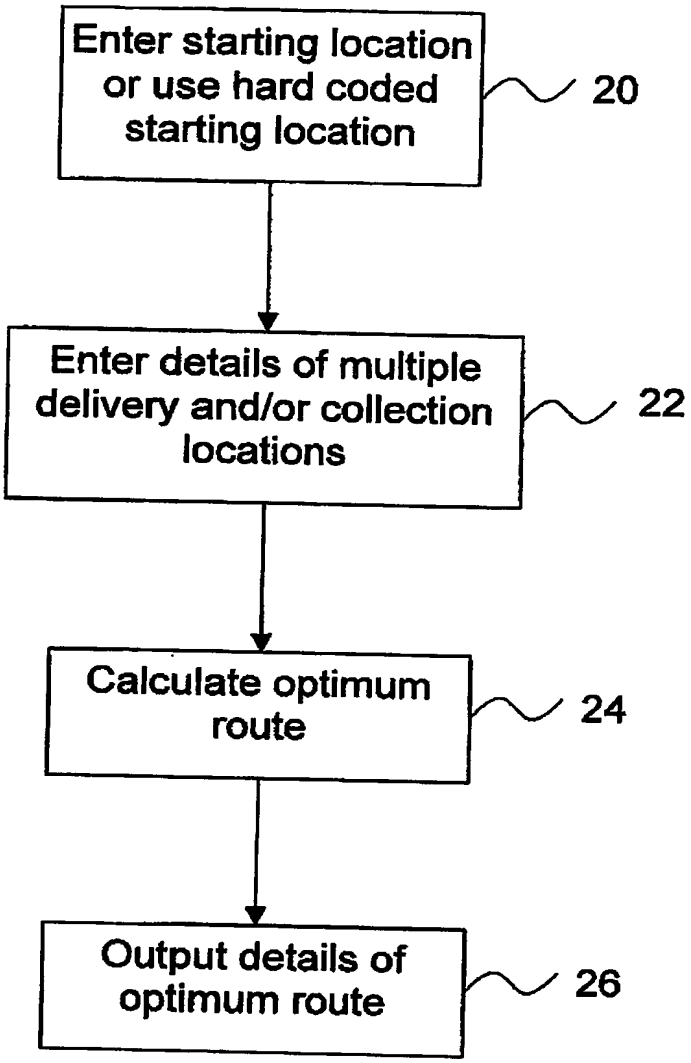
Enter starting location or use hard coded starting location
20
Enter details of multiple delivery and/or collection locations
22
Calculate optimum route
24
Output details of optimum route
26

FIG 2

FIG 3

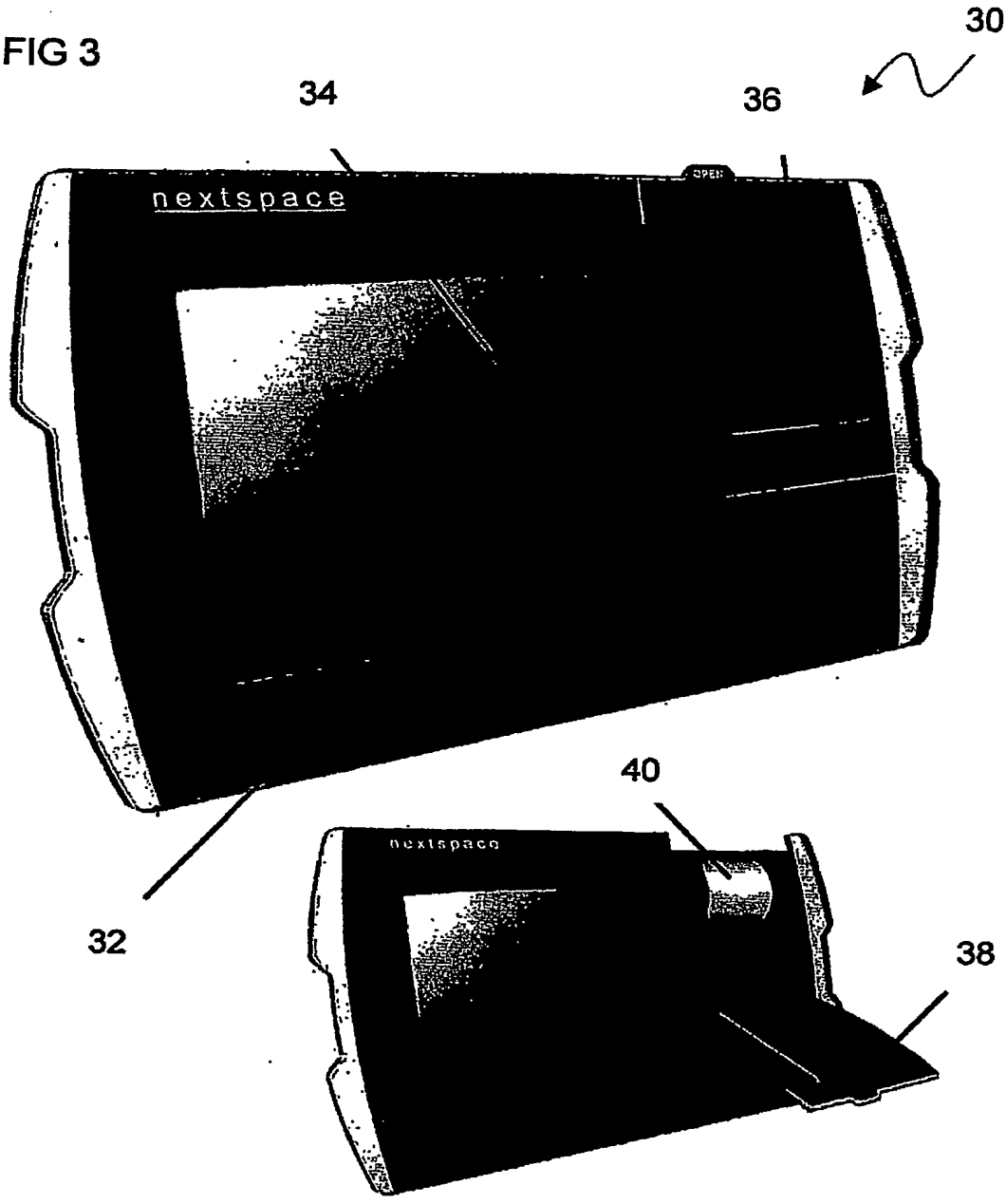

FIG 4